APPENDIX D

VAPOR INTRUSION PRESENTATIONS

Vapor Intrusion (VI) Investigation Summary

November 18, 2010

Access and VI Field Work

- 37 of the 48 property owners provided access for the VI sampling activities.
- Sampling has been completed at 36 of the 37 properties.
- FWEC will conduct the remaining sampling at the 1 remaining property once it receives notification from the property owner that the relevant household products have been removed from the home.
- The laboratory analytical results for the 37 properties have been received, reviewed for quality assurance, collated and distributed to the relevant property owners and USEPA.

VI Investigation Design

The VI Investigation was conducted in the following areas:

- Area 1 – Historical TCE groundwater detections – generally 130 to 200 µg/L.
- Area 2 – Historical TCE groundwater detections – generally 50 to 130 µg/L.
- Area 3 – Historical TCE groundwater detections – generally 5 to 50 µg/L.

The following summarizes by Area the sampling activities:

- Area 1 – Indoor air, sub-slab soil gas, and shallow groundwater sampling at all locations where access was provided.
- Area 2 – Sub-slab soil gas and shallow groundwater sampling at all locations where access was provided.
- Area 3 – Sub-slab soil gas and shallow groundwater sampling at 25% of the locations, so long as access was provided.

Summary of Sample Types

Sample Type	Sample Quantity	Properties
Indoor Air	15	7
Outdoor Air (Ambient)	7	7
Sub-Slab Soil Gas	61	26
Soil Gas	4	3
Shallow Groundwater	38	34
Shallow Groundwater Below Slab	1	1
Sump Water	6	4
Water from Pipe Discharge	3	3
Pond Water	1	1
Total	**136 Samples**	**37 Properties**

Summary of VI Results for TCE

Air and Soil Gas Sampling Results For TCE

Summary of Results for TCE

Indoor Air Samples

- For the 7 properties where indoor air sampling was conducted, the results ranged from not detected to 0.24 µg/m^3. The highest detected concentration was below the USEPA Regional Screening Level (RSL) of 1.2 µg/m^3.

Outdoor Air (Ambient) Samples

- For the 7 properties where outdoor air sampling was conducted, the results ranged from not detected to 0.081 µg/m^3. The highest detected concentration was below the USEPA RSL of 1.2 µg/m^3.

Summary of Results for TCE (Con't)

Sub-Slab Soil Gas Samples

- For 24 of the 26 properties where sub-slab soil gas sampling was conducted, the results ranged from not detected to 6.8 µg/m^3. The highest detected concentration was below the USEPA RSL of 12.0 µg/m^3.
- For 1 other property, located in Area 1, the sub-slab soil gas results ranged from 99 to 1,700 µg/m^3, above the USEPA RSL of 12.0 µg/m^3 for sub-slab soil gas. At this property, the highest detected indoor air concentrations were below the USEPA RSL for indoor air.
- For a 2nd other property, located in Area 2, the results ranged from 17 to 600 µg/m^3, above the USEPA RSL of 12.0 µg/m^3. No TCE was detected in the sump water sample taken from this property, and this property is vacant. Indoor air sampling has not yet been conducted at this property.
- FWEC is in the process of making arrangements for follow-up sampling with the 2 property owners.

Summary of Results for TCE (Con't)

Soil Gas Samples

- For the 3 properties where soil gas sampling was conducted, the results range from not detected to 0.29 µg/m^3. The highest detected concentration was below the USEPA RSL of 12.0 µg/m^3.

Summary of Results for TCE

Water Sampling Results For TCE

Summary of Results for TCE (Con't)

Shallow Groundwater Samples

- For 32 of the 34 properties where shallow groundwater sampling was conducted, the results ranged from not detected to 0.51 µg/L. The highest detected concentration was below the USEPA groundwater criteria of 5.0 µg/L.
- For 1 other property, the results were not detected, 0.88 and 98 µg/L. For the 2nd other property, the result was 43 µg/L. One result for each property was above the USEPA groundwater criteria of 5.0 µg/L. At each of these 2 properties, the result above the USEPA groundwater criteria was from a groundwater sample collected near a previously identified spring.
- FWEC is in the process of making arrangements for follow-up sampling with the 2 property owners.

Summary of Results for TCE (Con't)

Water Samples from Discharge Pipe

- For 3 properties, water samples were collected from a discharge pipe from a spring on the property. The springs had been sampled in the past.
- For 1 property, TCE was not detected in the collected sample.
- At the 2nd property, the result was 1.8 µg/L, below the USEPA groundwater criteria of 5.0 µg/L. This is the same property at which the shallow groundwater sample result was 43 µg/L.
- At the 3rd property, the result was 63 µg/L, above the USEPA groundwater criteria of 5.0 µg/L. This is the same property at which the shallow groundwater sample result was 98 µg/L.
- FWEC is in the process of making arrangements for follow-up sampling with the 2nd and 3rd property owners.

Summary of Results for TCE (Con't)

Groundwater Below Slab Sample

- For the 1 property where shallow groundwater was sampled below the slab, TCE was not detected in the collected sample.

Sump Water Samples

- For the 4 properties where sump water was sampled, TCE was not detected in the collected samples.

Pond Water Sample

- For the 1 property where pond water was sampled, TCE was not detected in the collected sample.

Conclusions

- The “multiple lines of evidence” sampling design collected a variety of sample types from numerous locations in the Affected Area, expanding on the previous sampling activities.
- The sampling results are generally consistent with or below the results of the previous sampling activities, including the soil gas and indoor air sampling previously conducted in 2004 to 2006.
- All of the 15 indoor air samples were below the USEPA RSL for TCE. Out of the 136 total samples taken, 7 were above any of the USEPA criteria for TCE. Those 7 samples were taken from a total of 3 properties.
- FWEC is in the process of making arrangements for follow-up sampling with 3 property owners.

End of

Vapor Intrusion (VI)

Investigation Summary

Foster Wheeler Energy Corporation/Church Road TCE Site

Vapor Intrusion Investigation Summary

November 18, 2010

What is Vapor Intrusion?

- Volatile compounds, such as TCE, can give off vapors;
- Vapors can accumulate under building foundations, basements, or crawl spaces and can seep through cracks or other openings;
- Long term exposure to vapors in indoor air may cause health concerns.

When is Vapor Intrusion a Potential Concern?

- Vapor intrusion may occur when groundwater TCE concentrations exceed the drinking water standard (5 ppb);
- Sampling conducted in 2005 at 10 locations with the highest TCE groundwater concentrations did not indicate vapor intrusion was occurring at levels exceeding applicable criteria;
- Current investigation expanded on previous work and was conducted in accordance with current EPA guidance, issued in June 2009.

Testing Rationale

- Higher groundwater concentration = higher potential for vapor intrusion;
- "Multiple lines of evidence" approach;
  - Shallow groundwater;
  - Sub-slab;
  - Indoor air.
- Sampling program was designed to be representative of the area and could be expanded based on initial results;
  - Conducted by FWEC's consultant, Tetra Tech, under EPA oversight.

Where Did Testing Occur?

- Area approach:
  - Area 1: TCE > 130 ppb
  - Area 2: 50 ppb < TCE < 130 ppb
  - Area 3: 5 ppb < TCE < 50 ppb
- Area 1 included indoor air, sub-slab, and shallow groundwater testing at all locations within criteria;
- Area 2 included sub-slab and shallow groundwater testing at all locations within criteria;
- Area 3 included sub-slab and shallow groundwater testing at 25% of locations within criteria;
- Testing was conducted at a total of 37 properties.

Test Results

- Results compared to EPA risk-based screening criteria;

- Results provided to homeowners individually and are confidential.

What is Risk?

- Risk calculations are used to set EPA Regional Screening Levels (RSLs) and Maximum Contaminant Levels (MCLs);

- Levels are set based on "excess cancer risk";
  - The number of additional cases of cancer that ***may*** occur from exposure over 30 years at the indicated concentration.

EPA's Risk Range

- Acceptable Risk Range: 10^{-6} to 10^{-4}:
  - 10^{-6}: 1 additional cancer in 1,000,000
  - 10^{-4}: 1 additional cancer in 10,000

- Risk < 10^{-6}: No additional action necessary;

- 10^{-6} < Risk < 10^{-4}: Additional investigation necessary;

- Risk > 10^{-4}: Remedial action necessary.

TCE Cancer Risk

- RSLs set at 10^{-6} risk;
- MCLs set at a concentration that is protective to human health and to which treatment is practicable, ***not*** at a level at which health impacts would be expected;
- TCE Indoor Air Risk:
  - 10^{-6}: 1.2 µg/m^3
  - 10^{-4}: 120 µg/m^3
- TCE Groundwater Risk:
  - 10^{-6}: 11 ppb
  - 10^{-4}: 1100 ppb